

DRAFT

A handwritten signature in dark ink, appearing to be 'J. Morales', is written below the 'DRAFT' stamp.

CARIBBEAN FISHERY MANAGEMENT COUNCIL
1108 Banco de Ponce Building
Hato Rey, Puerto Rico 00918

REPORT ON THE REEF FISH SIZE FREQUENCY SURVEY
JULY-SEPTEMBER, 1983

by Ignacio Morales-Santana
Fishery Economist-Statistician

February, 1984

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NOTE TO READERS

Funding for this project was provided by the U.S. Congress through the National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, under the dispositions of the Magnuson Fishery Conservation and Management Act of 1976 (PL-94--265).

The Caribbean Council contracted four agents to do the field work. The local Government Agencies, CODREMAR of Puerto Rico and Fish and Wildlife Division of U.S.V.I., assisted the Council staff in contracting the field agents and in their training and supervision of their work, as well as in making it possible that necessary field equipment (scales, rulers, etc.) provided by the Council, reach them.

The following persons participated directly or indirectly in the Survey:

1. José A. Collazo, Director P.R. Fisheries Research Laboratory, CODREMAR.
2. Clarissa Díaz, Field Agent, P.R. West
3. José Raúl Colón, Field Agent, P.R. East
4. Ralph Boulon, U.S.V.I. Division of Fish and Wildlife, St. Thomas
5. William Tobías, U.S.V.I. Division of Fish and Wildlife. St. Croix.
6. Dennis Rodríguez, Field Agent, St. Thomas
7. Héctor Rivera, Field Agent, St. Croix
8. Miguel A. Rolón, Chief Scientist, Caribbean Council
9. Ignacio Morales-Santana, Economist Statistician Caribbean Council
10. Other staff members of the CFMC.

Editing, coding, tabulation, summaries, and final reports were made at the Caribbean Council Office under direct supervision of the fishery Economist-Statistician, Ignacio Morales-Santana.

ABSTRACT

A Size Frequency Survey of snappers, groupers and other shallow-water reefish species was conducted by the CFMC during July-September, 1983, in its area of jurisdiction, to examine the impact of minimum size regulations proposed in the Shallow-Water Reefish Plan. Eight species were covered in the survey; yellowtail snapper, Nassau grouper, queen triggerfish, red hind, schoolmaster, yellowfin grouper, mutton snapper and trunkfish. The number of observations for the last four, however, was too small to be significant in the analysis of the survey results.

Yellowtail snapper and Nassau grouper, with a proposed minimum size of 300 mm, were 42% and 31%, respectively, below that size. In the case of the Nassau grouper, 99 percent were below the limit of 600 mm, which is the minimum size proposed after a period of 12 years, by adding 25 mm per year to the initial minimum size of 300 mm.

I. Introduction

A size frequency survey of snappers and groupers in Puerto Rico and the U.S. Virgin Islands was conducted by the CFMC during the months of July through September, 1983. This survey originated as a Council's need to document the management measures proposed in the Shallow-Water Reefish Plan, related to minimum sizes. The survey would be continued during FY-84 by the local governments, through State-Federal Agreement programs.

II. Methodology

A. Species included:

1. Yellowtail snapper
2. Queen Triggerfish
3. Red hind
4. Nassau grouper
5. Yellowfin grouper
6. Schoolmaster snapper (U.S.V.I. only)
7. Mutton snapper
8. Trunkfish (P.R. only)

B. Areas covered:

1. Puerto Rico East coast
2. Puerto Rico West coast
3. St. Croix
4. St. Thomas

C. Field Work

Four agents were employed, one in each area, and they were given equipment for measuring and weighing the fish, as well as pertinent instructions of how to record the total length and weight of the fish. For Queen Triggerfish, they were instructed to record the fork length too.

D. Tabulation

Completed forms were received at the Council's Office, and were edited and coded to be processed in the Apple II Plus Computer. Apple's DB Master Program was used to tabulate and summarize the data.

E. Criteria used in determining the sample size for the survey:

- | | | |
|---|---|----------------|
| 1. Estimated total landings for 1983 in P.R. | = | 5,000,000 lbs. |
| 2. Total landings of wanted species (4.4%) | = | 220,000 lbs. |
| 3. Sample of ports (55.4% of total landings)* | = | 121,880 lbs. |
| 4. Sub-sample of months (26.1% of annual landings) | = | 31,811 lbs. |
| 5. Equivalent in number of fish (1.5 lbs. per fish) | = | 21,207 fish |
| 6. Sub-sample of fish of the wanted species | = | <u>a/</u> |
| 7. Over-all sampling rate | = | <u>b/</u> |
-

a/ Agents were instructed to measure all the fish they could, of the wanted species.

b/ Would depend on how many fish, of the wanted species, the agents would be able to measure; 10% or more would be acceptable. A total of 2677 (12.6%) were actually measured in Puerto Rico and 1835 in U.S. Virgin Islands, for a total of 4512 fish. The difference in sample size between Puerto Rico and U.S. Virgin Islands is proportional to the difference in the landings of both areas.

* It was decided to include the most important fishing areas which are the West and East Coasts. In each one, the most active 4 ports were chosen for the study. The 8 chosen ports (4 in each coast), account for 55% of the total landings.

III. Survey Results

1. Number of fish measured

A total of 4512 fish were measured, covering 8 species, as follows:

| Species | Number of fish Measured | | |
|-------------------------|-------------------------|----------|-------|
| | P.R. | U.S.V.I. | TOTAL |
| a) Yellowtail snapper | 622 | 904 | 1526 |
| b) Queen Triggerfish | 339 | 488 | 827 |
| c) Red hind | 1307 | 307 | 1614 |
| d) Nassau grouper | 304 | 23 | 327 |
| e) Yellowfin grouper | 31 | 32 | 63 |
| f) Schoolmaster snapper | - | 45 | 45 |
| g) Mutton snapper | 11 | 36 | 47 |
| h) Trunkfish | 63 | - | 63 |
| TOTAL | 2677 | 1835 | 4512 |

2. Minimum, Maximum and Average Length

Yellowtail snapper had a minimum size of 152 mm and a maximum of 432 mm. The average size was 305 mm and 42% of the catch was below the average. Queen Triggerfish had a minimum size of 178 mm and a maximum of 508 mm. The average size was 305 mm and 50% was below the average. Redhind had a minimum size of 152 mm and a maximum of 508 mm. The average size was 279 mm and 53% was below the average. Nassau grouper had a minimum of 178 mm and a maximum of 737 mm. The average size was 330 mm and 45% of the catch was below the average.

3. Minimum, Maximum and Average Weight

Yellowtail snapper had a minimum weight of 68 gm. and a maximum of 653 gm. The average was 476 gm. Queen Triggerfish had a minimum weight of 141 gm. and a maximum of 1,905 gm. The average weight was 703 gm. Redhind had a minimum weight of 86 gm. and a maximum of 1,225 gm. The average weight was 340 gm. Nassau groupers had a minimum of 122 gm. and a maximum of 2,540 gm. The average weight was 762 gm.

| Species | Length (mm) | | | Weight (gm) | | |
|--------------------|-------------|---------|---------|-------------|---------|---------|
| | Minimum | Maximum | Average | Minimum | Maximum | Average |
| Yellowtail snapper | 152 | 432 | 305±? | 68 | 653 | 476±? |
| Queen Triggerfish | 178 | 508 | 305±? | 141 | 1905 | 703±? |
| Red hind | 152 | 508 | 279±? | 86 | 1225 | 340±? |
| Nassau grouper | 178 | 737 | 330±? | 122 | 2540 | 762±? |

Tables A through D present the above information by island and zones.

TABLE A: YELLOWTAIL SNAPPER: Length-Weight Data

| ITEM | Puerto Rico | | | U.S. Virgin Islands | | | Grand Total or Average \bar{x} |
|-----------------------|-------------|------|---------------------------------------|---------------------|--------------|-----------------------------|---|
| | West | East | Sub- Total or Ave. \bar{x} | St. Thomas | St. Croix | Sub- Total or Ave. | |
| No. Measured | 437 | 185 | 622 \pm | 484 | 420 | 904 | 1526 |
| Length (mm.)* | | | | | | | |
| Minimum | 152 | 203 | 152 | 254 | 178 | 178 | 152 |
| Maximum | 483 | 432 | 483 | 432 | 584 | 432 | 432 |
| Average $\bar{x} \pm$ | 279 | 279 | 279 | 330 | 330 | 330 | 305 |
| Weight (gm.) | | | | | | | |
| Minimum | 68 | 82 | 68 | 408 | 113 | 113 | 68 |
| Maximum | 880 | 653 | 653 | 1315 | 1814 | 1315 | 653 |
| Average $\bar{x} \pm$ | 272 | 231 | 263 | 739 | 485 | 621 | 476 |

*Total length

TABLE B: QUEEN TRIGGERFISH: Length-Weight Data

| ITEM | Puerto Rico | | | U.S. Virgin Islands | | | Grand Total or Average |
|-----------------------|-------------|------|-----------------------------|---------------------|--------------|-----------------------------|---------------------------------|
| | West | East | Sub- Total or Ave. | St. Thomas | St. Croix | Sub- Total or Ave. | |
| No. Measured | 188 | 151 | 339 | 368 | 120 | 488 | 827 |
| Length (mm)* | | | | | | | |
| Minimum | 203 | 178 | 178 | 178 | 203 | 178 | 178 |
| Maximum | 508 | 457 | 508 | 406 | 457 | 457 | 508 |
| Average $\bar{X} \pm$ | 305 | 279 | 305 | 305 | 305 | 305 | 305 |
| Weight (gm.) | | | | | | | |
| Minimum | 141 | 118 | 141 | 363 | 141 | 141 | 141 |
| Maximum | 1869 | 1207 | 1869 | 1769 | 1905 | 1905 | 1905 |
| Average $\bar{X} \pm$ | 744 | 540 | 653 | 744 | 717 | 739 | 703 |

*Fork length

TABLE C: REDHIND: Length-Weight Data

| ITEM | Puerto Rico | | | U.S. Virgin Islands | | | Grand Total or Average |
|--------------|-------------|------|-----------------------------|---------------------|--------------|-----------------------------|---------------------------------|
| | West | East | Sub- Total or Ave. | St. Thomas | St. Croix | Sub- Total or Ave. | |
| No. Measured | 960 | 347 | 1307 | 159 | 148 | 307 | 1614 |
| Length (mm) | | | | | | | |
| Minimum | 178 | 178 | 178 | 152 | 178 | 152 | 152 |
| Maximum | 508 | 457 | 508 | 381 | 457 | 457 | 508 |
| Average | 279 | 279 | 279 | 254 | 279 | 254 | 279 |
| Weight (gm.) | | | | | | | |
| Minimum | 91 | 86 | 86 | 227 | 114 | 114 | 86 |
| Maximum | 2118 | 1706 | 2118 | 1225 | 1361 | 1225 | 1225 |
| Average | 290 | 349 | 304 | 626 | 363 | 499 | 340 |

*Total length

TABLE D: NASSAU GROUPER: Length-Weight Data

| ITEM | Puerto Rico | | | U.S. Virgin Islands | | | Grand Total or Average |
|--------------|-------------|------|-----------------------------|---------------------|--------------|-----------------------------|---------------------------------|
| | West | East | Sub- Total or Ave. | St. Thomas | St. Croix | Sub- Total or Ave. | |
| No. Measured | 219 | 85 | 304 | 12 | 11 | 23 | 327 |
| Length (mm)* | | | | | | | |
| Minimum | 178 | 203 | 178 | 279 | 279 | 279 | 178 |
| Maximum | 559 | 533 | 559 | 737 | 610 | 737 | 737 |
| Average | 330 | 356 | 330 | 457 | 457 | 457 | 330 |
| Weight (gm.) | | | | | | | |
| Minimum | 141 | 122 | 122 | 862 | 422 | 422 | 122 |
| Maximum | 3157 | 2762 | 3157 | 3905 | 4540 | 4540 | 4540 |
| Average | 581 | 821 | 649 | 2295 | 2245 | 2268 | 762 |

*Total length

4. Size Distribution

The size distribution of the four most important species is shown below:

| Size (mm) | Yellowtail Snapper | Queen Triggerfish (Per-cent) ^a | Redhind | Nassau Grouper |
|-----------------|-----------------------|---|---------|-------------------|
| Less than 165 | 0.07 | - | .56 | - |
| 165 through 189 | 0.52 | 0.48 | 1.55 | 0.31 |
| 190 through 214 | 4.52 | 3.51 | 7.32 | 1.22 |
| 215 through 239 | 6.75 | 11.73 | 20.40 | 6.73 |
| 240 through 264 | 11.01 | 15.72 | 23.12 | 5.81 |
| 265 through 289 | 19.40 | 18.26 | 21.88 | 16.82 |
| 290 through 314 | 13.70 | 18.50 | 11.04 | 14.37 |
| 315 through 339 | 15.53 | 13.91 | 6.14 | 17.74 |
| 340 through 364 | 10.81 | 8.34 | 3.66 | 8.26 |
| 365 through 389 | 7.08 | 5.20 | 2.48 | 9.48 |
| 390 through 414 | 5.90 | 3.63 | 1.05 | 3.06 |
| 415 through 439 | 2.42 | 0.36 | 0.56 | 3.67 |
| 440 through 464 | 1.05 | 0.24 | 0.12 | 3.37 |
| 465 through 489 | 0.65 | 0.12 | 0.06 | 1.83 |
| 490 through 514 | 0.39 | - | 0.06 | 3.06 |
| 515 through 539 | 0.07 | - | - | 1.83 |
| 540 through 564 | 0.07 | - | - | 0.61 |
| 565 through 589 | 0.07 | - | - | 0.61 |
| 590 through 614 | - | - | - | 0.61 |
| 615 or more | - | - | - | 0.61 |
| TOTAL | 100.00% | 100.00% | 100.00% | 100.00% |

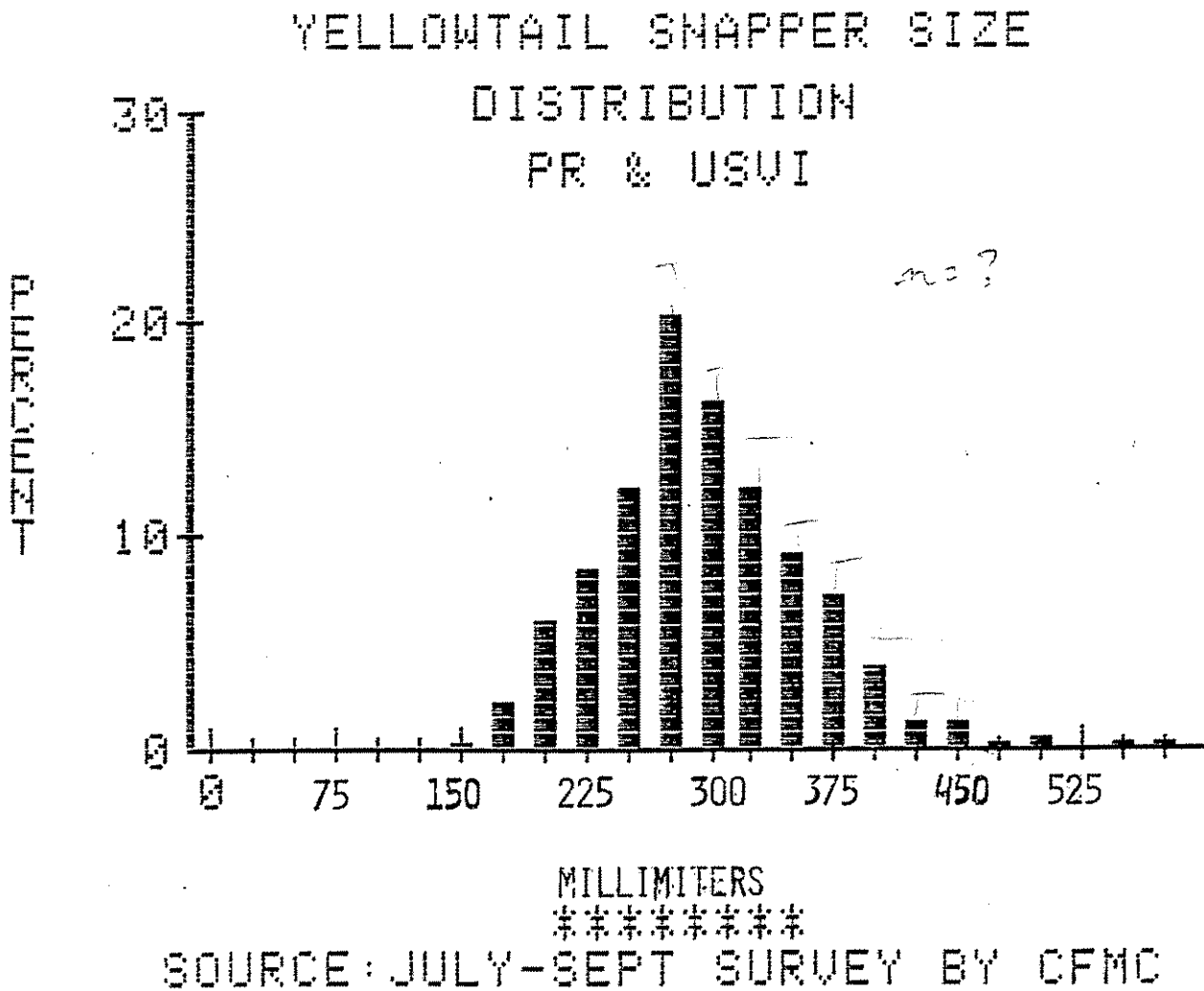
To know the percentage below any chosen size, see next table.

SIZE DISTRIBUTION OF FOUR MAIN SPECIES FROM THE 3-MONTH SURVEY

| Size (mm) | Yellowtail Snapper | Queen Triggerfish | Redhind | Nassau Grouper |
|--------------|--------------------------|----------------------|---------|-------------------|
| | (Cumulative Percentages) | | | |
| < 240 | 11.86 (#) | 15.72 (#) | 29.83 | 8.26 |
| < 265 | 22.87 | 31.44 | 52.95 | 14.07 |
| < 290 | 42.27 | 49.70 | 74.83 | 30.89 |
| < 315 | 55.97 | 68.20 | 85.87 | 45.26 |
| < 340 | 71.50 | 82.11 | 92.01 | 63.00 |
| < 365 | 82.31 | 90.45 | 95.67 | 71.26 |
| < 390 | 89.39 | 95.65 | 98.15 | 80.74 |
| < 415 | 95.29 | 99.28 | 99.20 | 83.80 |
| < 440 | 97.71 | 99.64 | 99.76 | 87.47 |
| < 465 | 98.76 | 99.88 | 99.88 | 90.84 |
| < 490 | 99.41 | 100.00 | 99.94 | 92.67 |
| < 515 | 99.80 | 100.00 | 100.00 | 95.73 |
| < 540 | 99.87 | 100.00 | 100.00 | 97.56 |
| < 565 | 99.94 | 100.00 | 100.00 | 98.17 |
| < 590 | 100.00 | 100.00 | 100.00 | 98.78 |
| < 615 | 100.00 | 100.00 | 100.00 | 99.39 |
| < 640 | 100.00 | 100.00 | 100.00 | 100.00 |

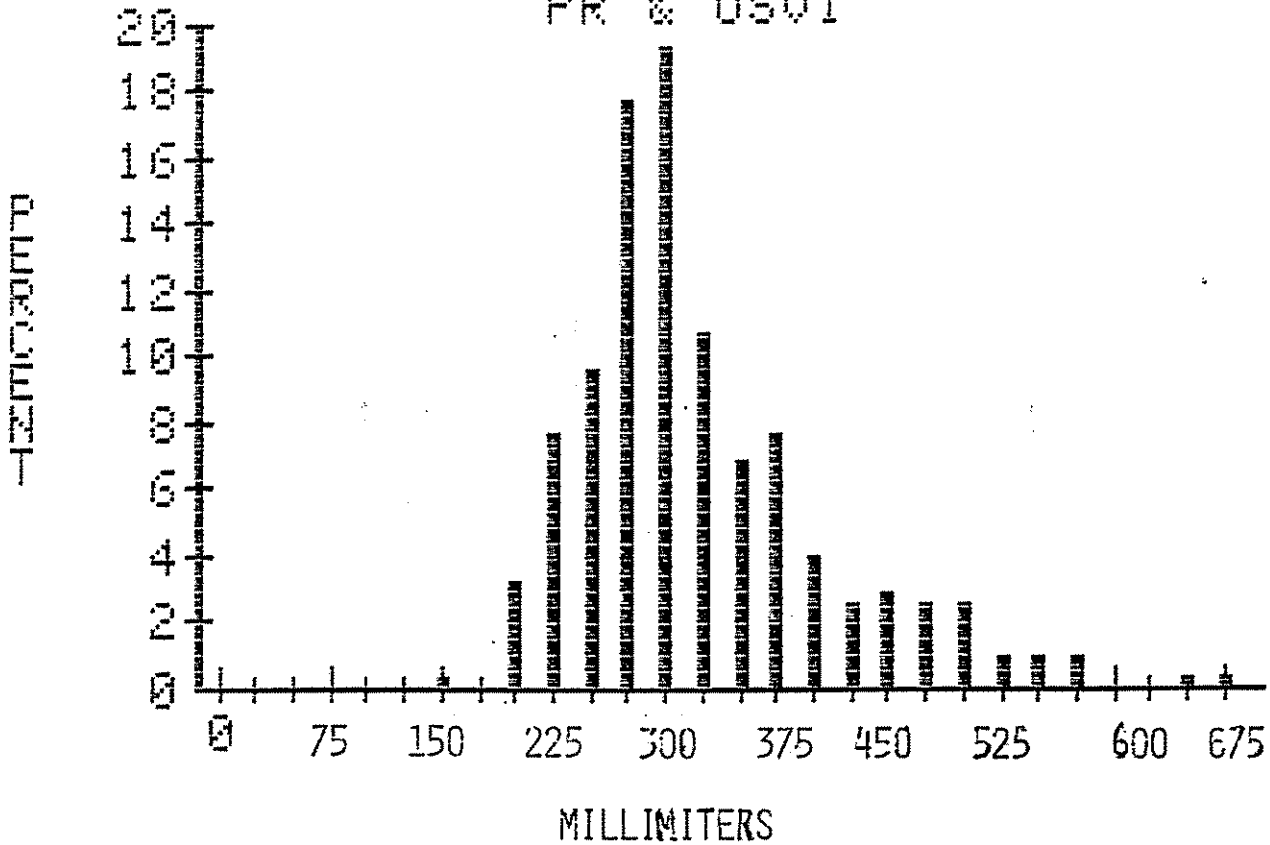
Following are some size frequency and regression charts of the length-weight data. Copies of the computer print-outs and additional graphs and tables by geographical areas (P.R. West, P.R. East, St. Thomas, St. Croix) are available at the CFMC Office.

GRAPH 1



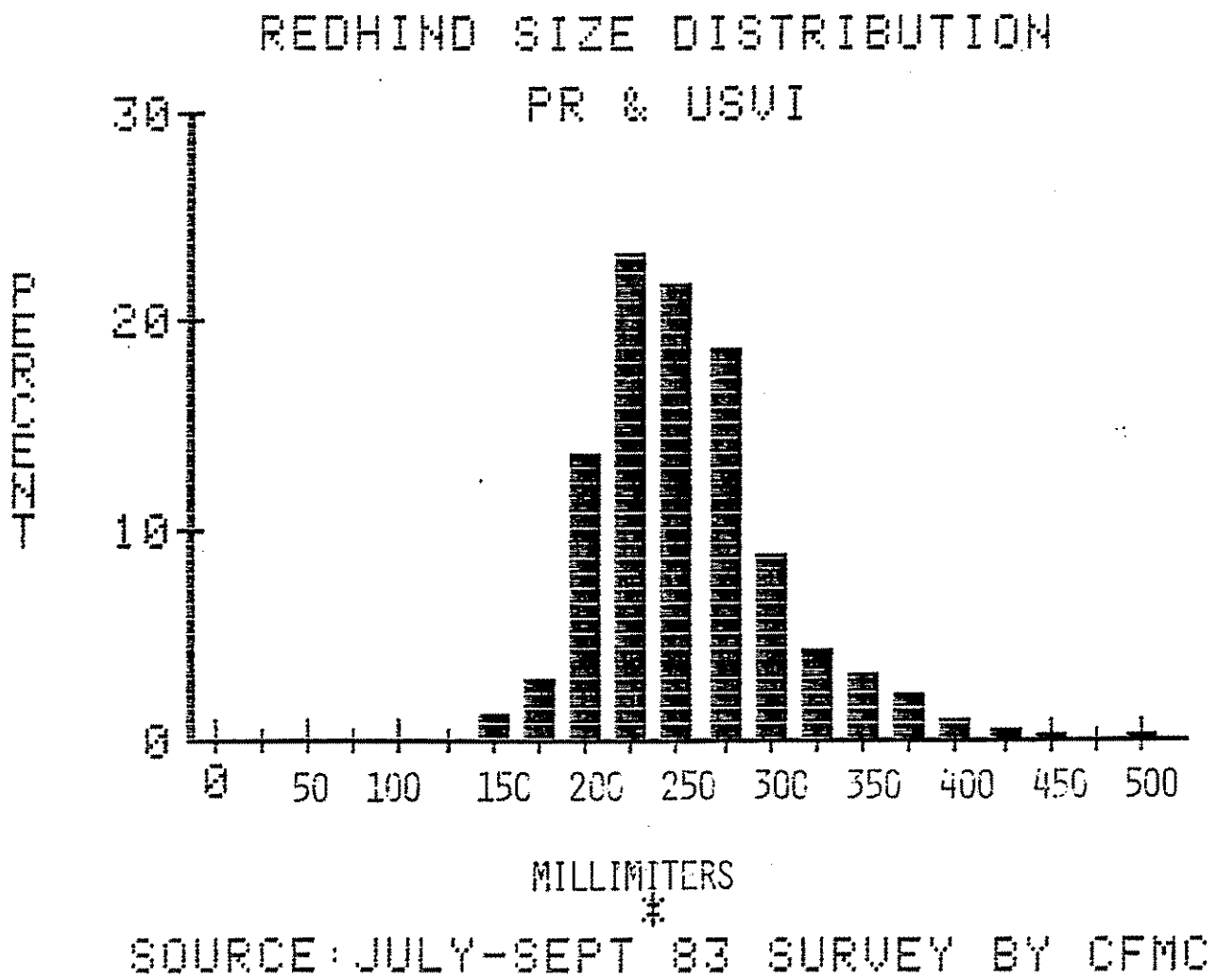
GRAPH 2

NASSAU GROUPER SIZE DISTRIBUTION
PR & USVI

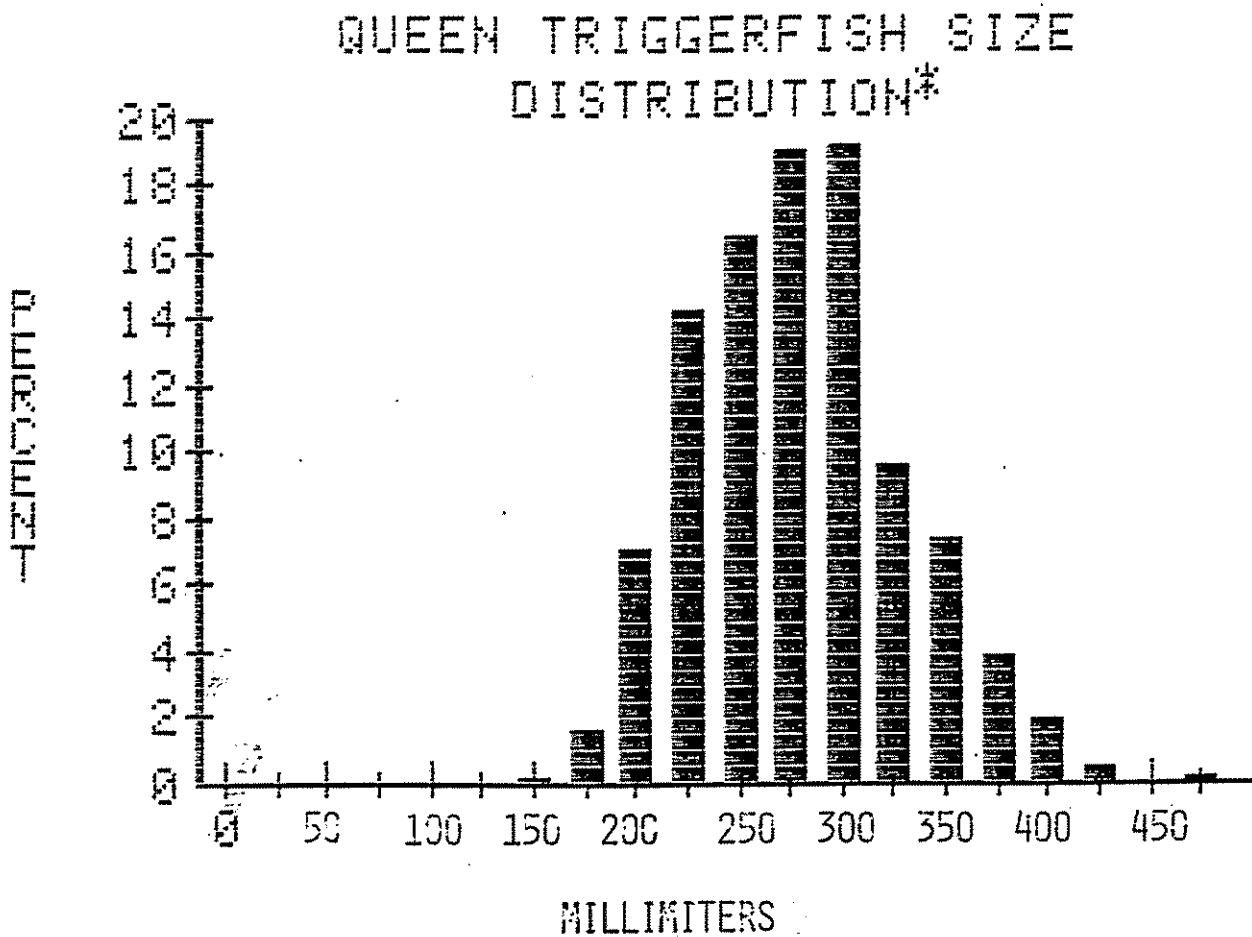


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SOURCE: JULY-SEPT 83 SURVEY BY CFMC

GRAPH 3



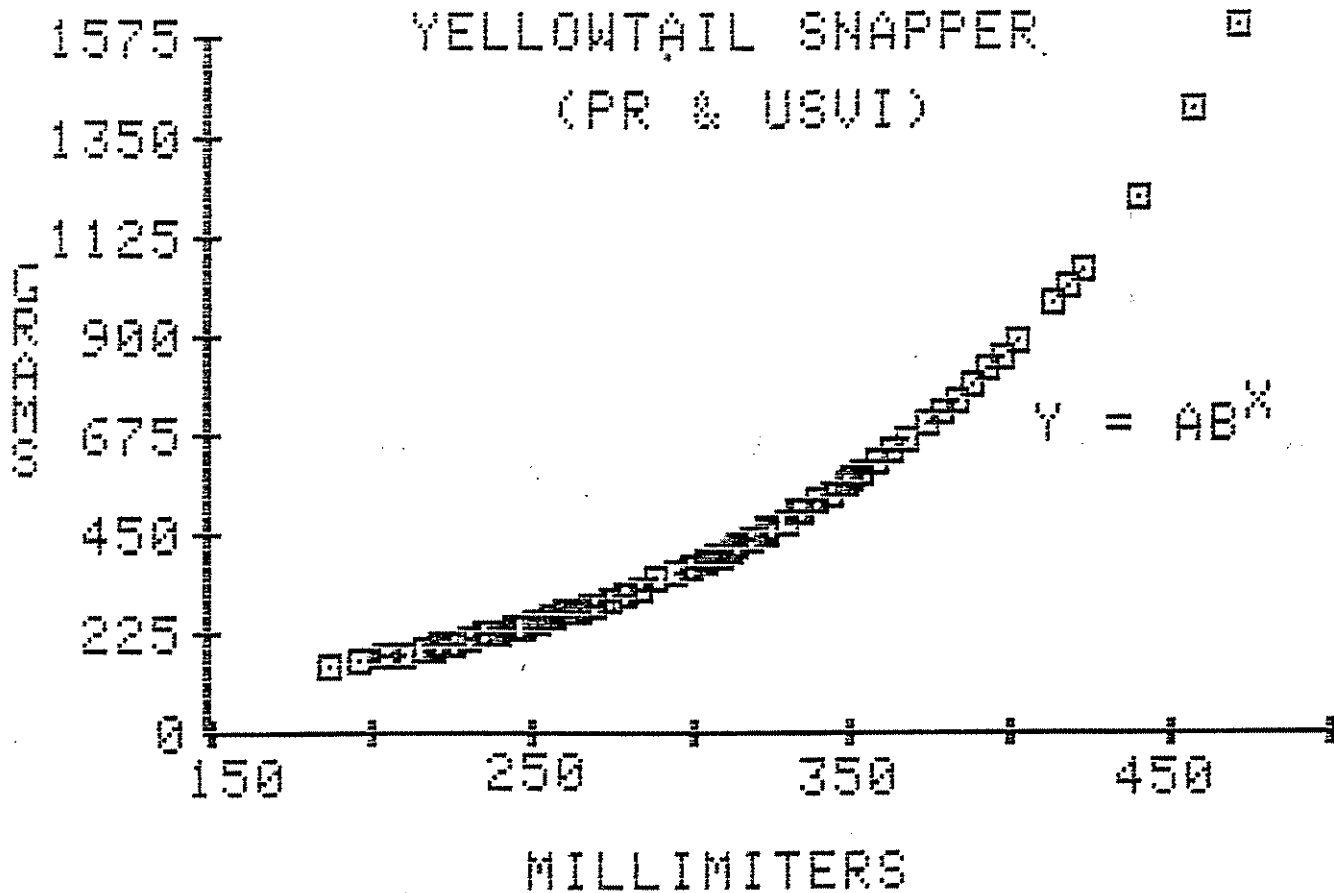
GRAPH 4



* SOURCE: JUL-SEP 83 SURVEY BY CFMC IN
P.R. AND U.S.V.I.

GRAPH 5

LGTH-WGHT RELATIONSHIP FOR
YELLOWTAIL SNAPPER
(PR & USVI)



SOURCE: CFMC 3-MONTH SURVEY